

## **KSC- America's Gateway to Space**

This is a very challenging time for all of us at NASA. Due to shifts in priorities, policies, and budgetary constraints, NASA is having to reinvent itself—and as a result, KSC must do the same.

We are in the midst of re-defining what we do and how we do it.

The great thing about that is that we have the opportunity to shape the future. We can define America's future in space.



### **KSC Moving into the Future – “We’re not closing”**

KSC fits into the overall NASA vision and mission by moving forward so that what we do and learn will benefit all here on Earth. In January of last year, KSC revised its Mission and Vision statements to articulate our identity as we align with this new direction the Agency is heading.

Currently KSC is endeavoring to form partnerships with industry, Government, and academia, utilizing institutional assets and technical capabilities to support current and future missions. With a goal of safe, low-cost, and readily available access to space, KSC seeks to leverage emerging industries to initiate development of a new space launch system, oversee the development of a multipurpose crew vehicle, and assist with the efficient and timely evolution of commercial crew transportation capabilities. At the same time, KSC is pursuing modernizing the Center’s infrastructure and creating a multi-user launch complex with increased on-site processing and integration capabilities.

**KSC Overarching Goals**

- Ensure mission success by providing government and commercial access to space
- Develop, operate, and sustain a robust launch complex for all providers
- Conduct research and technology development to enable mission success
- Provide a robust institution to enable success
- Inspire, engage, and educate through enriching programs, internships, and mutually beneficial partnerships

## KSC Overarching Goals

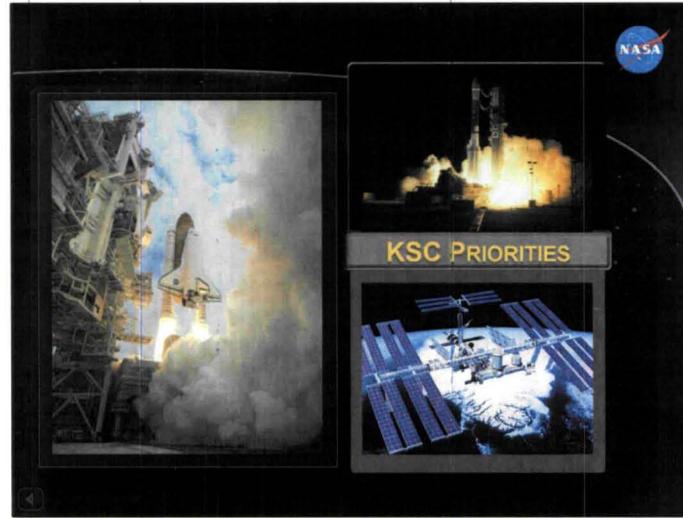
Ensure mission success by providing government and commercial access to space. - To do this, we will create operational services that would benefit multiple users, proactively capturing commercial partnerships, and ultimately making KSC commercially friendly.

Develop, operate, and sustain a robust launch complex for all providers. - Transforming KSC into the premier 21<sup>st</sup> Century Launch Complex will enable processing and launch of one government and two or more commercial launch systems from Launch Complex 39, and will enable four or more government or commercial customers operating from the Shuttle Landing Facility.

Conduct research and technology development to enable mission success. - KSC will enhance the Research & Technology efforts currently underway, and will expand in areas within KSC's traditional expertise and beyond.

Provide a robust institution to enable success. - To reach this goal, we need to transform our organization and institutional services, and we must be able to preserve our talented workforce by attracting highly skilled businesses to the area.

Inspire, engage and educate through enriching programs, internships, and mutually beneficial partnerships. - In 2010 we created the Kennedy Educate to Innovate program in which employees have been trained and given tools to conduct outreach to schools based on topics related to science, technology, engineering, and math. We are reaching out into our communities, to inspire and mentor the next generation of scientists and engineers.



## KSC Priorities

**Close-out Shuttle Program** - Just finished safely launching/landing the final mission, transition and retire orbiters, support vehicles move to new homes for display and education

**LSP** - Our Launch Services Program (LSP) will continue to launch NASA payloads with expendable rockets to study our universe. We have three launches remaining this year, and are working more than 40 future missions.

**GRAIL**, targeted to launch Sept. 8, 2011 -- ULA Delta II Heavy from Cape Canaveral Air Force Station

**NPP**, targeted to launch Oct. 25, 2011

**Mars Science Laboratory**, targeted to launch Nov. 25, 2011 -- United Launch Alliance Atlas V from Cape Canaveral Air Force Station

**ISS** - With the extension of the ISS, American astronauts will be living and working in space to advance human space exploration technology until at least 2020. KSC will continue to process and launch the payloads in preparation for flight to the ISS. NASA has already procured 20 commercial cargo resupply transportation missions to the ISS that will launch from 2012-2015, 12 of which will launch from KSC

**KSC CHALLENGES**

- Cultural changes
- Programmatic evolution
- Budget constraints and overall economic climate
- Workforce changes
- Facilities usage and sustainment

## KSC Challenges

KSC is facing a brand new environment which includes many changes

**Cultural changes** - Include the end of a 30-year program, loss of a mission, future path getting clearer but not completely defined, loss of personnel with certain experience base and skill sets. Cultural changes are the hardest to overcome. KSC will focus on what we can control in uncertain times, lay out a potential path and communicate that direction to all internal and external stakeholders

**Programmatic evolution** – New era of commercial crew (CCP), shared resources between government and commercial entities (21CGP), continued support for ISS, requirement for heavy lift (SLS)

**Budget constraints** - Overarching austere times in the U.S. economy, continuing resolutions versus an approved budget, CMO shortfalls, Government shutdown, etc. all have an impact on future programs, construction, and workforce shaping. Budget shortfalls must be dealt with by evolving how we do business. KSC will become more efficient with the resources we have (including dollars, facilities, and people).

**Economic Climate** - The White House and Congress are committed to fiscal reform. More reductions in any final budget are a decided possibility. The Space Coast economic climate is still very volatile and intrinsically tied to KSC.

**Workforce Changes** - There will be major job loss created by the end of the Shuttle Program. Projected numbers are 7,000-9,000 direct, and an additional 12,000 to 16,000 indirect (based on Brevard Workforce projections). KSC is working with various outside organizations to try to find these skilled workers new employment. No current industry can provide the number of jobs that NASA has provided in the past. Some impacts are that people will potentially leave the area due to no or under-employment. This has the potential to create a loss of critical skills and core competencies that could effect the ability to support programs and/or commercial contracts as we move forward.

**Facility Usage and Maintenance** - Constant maintenance is required to sustain all KSC facilities due to weather/location. Upgrades are needed to move the Center to a "21<sup>st</sup> Century Launch Complex" configuration and a green/sustainable spaceport of the future which can support both government and commercial requirements.

**KSC OPPORTUNITIES**

- Commercial space transportation and services
- Multiuser space launch complex
- Business development and creative partnerships
- Promote cultural shift

## KSC Opportunities

**Commercial Space Initiative** - KSC will help facilitate the development of a U.S. commercial crew space transportation capability with the goal of achieving safe, reliable, and cost effective access to and from Low Earth Orbit and the International Space Station. Once the capability is matured and expected to be available to the government and other customers, NASA could purchase commercial services to meet its ISS crew transportation needs. Enabling commercial space is a cultural shift for NASA and KSC will play a vital part.

**Multi-user Space Launch Complex** - KSC's role as a traditional one-system launch complex is transforming to become a true spaceport supporting multiple users -programmatic, commercial, & public.

**Business Development** - The new Agency direction significantly increases KSC's need for proactive, integrated business planning and development. This is a fundamental change in how NASA does business with commercial entities. By "marketing" our Center capabilities vs. directed use, we can capitalize on ALL the Center's capabilities, not just launch infrastructure. KSC is seeking to identify potential industry interest in some agency real property asset. The notice that went out describes assets that are currently, or will soon become, underutilized as a result of the transition from the Space Shuttle Program to the future mission activities.

**Creative Partnerships** - KSC is striving to build strong, mutually beneficial partnerships. Currently we have a wonderful working relationship with Space Florida to assist us in our partnership creation opportunities. A couple of examples are, our partnership with the Florida Power and Light Company, which constructed two photovoltaic generation systems on KSC property—one of which provides 1% of KSC's electricity, and the other provides 1,100 homes worth of power. And Starfighters, Inc., a Tarpon Springs, Florida-based company that is utilizing KSC's Shuttle Landing Facility for training endeavors with its fleet of Starfighter jets.

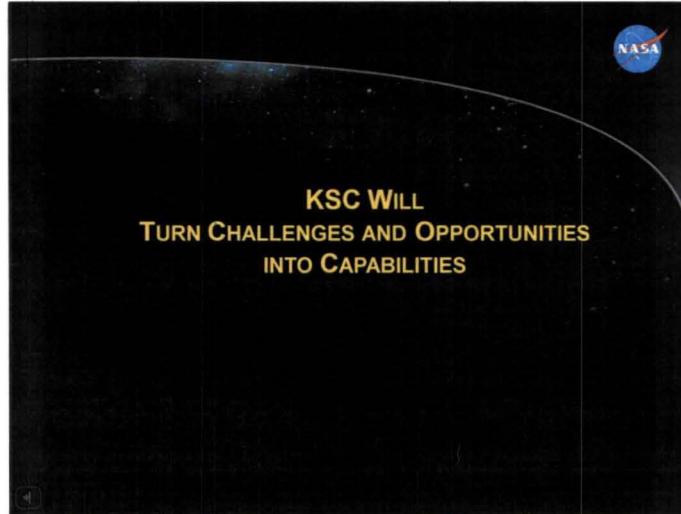
**Promote Cultural Shift** - KSC must position the Center for implementation of new/ongoing NASA goals and objectives. This has created a very dynamic environment and we are making the adjustments necessary to support new missions and/or programs.

**KSC will utilize the "6 C's" to help a culture shift to occur** - Confront reality : end of Shuttle, maintain worker skill sets, cancellation of Constellation, contractor layoffs, civil service planning and repurposing

Courageous conversations: talk, explain the NASA/KSC role in future space operations, be mindful of legislative sensitivity, consistent message for internal and external audiences. Constant transition and change: NASA's direction can change, it's an unclear future, KSC will chart a path, maintain a clear consistent message.

Commitment/conviction: distraction due to end of 30 year program, re-affirm commitment of all workers is ongoing, safety first always. Care of yourself: take time for you, physical and emotional support available.

Collaboration: partnerships with commercial entities are challenging, government brings regulation and guidelines that can restrict the space industries bottom line, partner not compete with other NASA Centers and government agencies.



To create a viable future KSC is and will continue to turn our challenges and opportunities into "marketable" capabilities

**COMMERCIAL SPACE CAPABILITIES**

Emerging entrepreneurial industries at KSC

- Reusable launch vehicles
- Commercial crew and cargo
- Suborbital spaceflight for STEM, research, and tourism
- NASA free to focus beyond LEO

## Commercial Crew

Commercial Crew Program Office established at KSC

Commercial Crew is designed to accommodate a diverse group of people for ISS operations, science, research, and tourism

### **Successful Commercial Crew will:**

- Transform human spaceflight for future generations
- Result in safe, reliable, cost effective crew transportation to Low Earth Orbit (LEO) and in support of ISS
- Free NASA's limited resources for beyond-LEO exploration
- Reduce reliance on foreign systems

Awarded four Space Act Agreements (SAAs) in April 2011 as part of CCDev2 effort:

Blue Origin - \$22 million

Sierra Nevada Corporation - \$80 million

Space Exploration Technologies (SpaceX) - \$75 million

The Boeing Company - \$92.3 million



## Human Exploration Capability

Develop the launch and spaceflight vehicles that will provide the initial capability for crewed exploration missions beyond LEO. In particular, the Space Launch System (SLS) program will develop the heavy lift vehicle that will launch the crew vehicle, other modules and cargo for these missions. The Multi-Purpose Crew Vehicle (MPCV) program develops the vehicle that will carry the crew to orbit, provides emergency abort capability, sustain the crew while in space, and provide safe re-entry from deep space return velocities.

### Space Launch System Program:

- Heavy Lift Launch Vehicle with an initial lift capability of 70-100mt evolvable to the ultimate capability to 130mT
- Reference Vehicle Design is derived from legacy hardware
- Capability to lift the MPCV
- Capabilities to be a backup system for ISS cargo and crew delivery

### Multi-Purpose Crew Vehicle Program:

- Spacecraft to serve as the primary crew vehicle for missions beyond LEO
- Capable of conducting regular in-space operations (rendezvous, docking, extravehicular activity) in conjunction with payloads delivered by SLS for missions beyond LEO
- Capability to be a backup system for ISS cargo and crew delivery

### Responsibilities:

*Space Launch System Program Office (MSFC):* develop the heavy lift launch vehicle elements, formulation team established to develop program structure and interfaces - KSC is an active member of the formulation team

*KSC Project Office:* Provide end-to-end project management for the ground infrastructure development and ground processing operations in support of the heavy lift and multi-purpose crew vehicles; develop flight-to-ground interface and test and verification requirements; influence flight and ground hardware and software designs for efficient and cost-effective sustained operations; provide programmatic support to the Space Launch System, 21st CSLC and MPCV Programs; leverage institutional technical resources



#### 21<sup>st</sup> Century Ground Systems Program - A Flexible Approach to a Multi-user Launch Complex

The NASA Authorization Act of 2010 includes modernizing KSC launch facilities to accommodate future commercial activities. We want to take a flexible approach to satisfy the requirements of multiple users and become the world's premier launch complex.

The Florida Launch and Range Complex will be transformed into a futuristic launch facility by NASA's 21<sup>st</sup> Century Ground Systems Program.

The primary purpose of this program is to prepare the infrastructure at the Kennedy Space Center needed to enable processing and launch of the Space Launch System. The Program, designed to makeover the Center, will align with the needs of civil, national security, and commercial enterprises - ultimately extending to the international space community.

- KSC's 21st Century Ground Systems Program will modify our facilities for NASA to explore beyond LEO with an evolvable heavy lift vehicle (SLS) and crew capsule (MPCV) while also enabling commercial space.
- Commercial capabilities will include test support, small sounding rockets, horizontal launch and recovery.
- We will also be partnering with commercial, DoD, state and federal agencies to prioritize and modernize launch assets; jointly improve command, control, communication and range infrastructure; and provide the capability to support production, processing, and recovery of space systems.

**WORKFORCE CAPABILITIES**

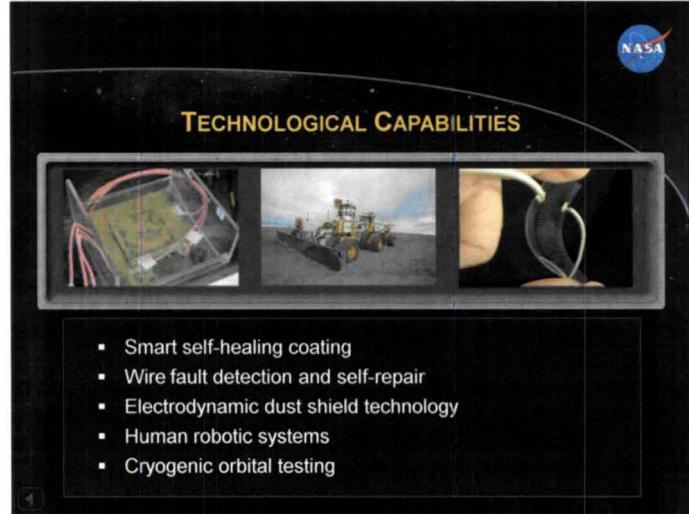
- Highly skilled, technical workers
- Committed to science, engineering, mathematics
- Dedicated to space program
- World's most experienced workforce in launch of humans and other high-value payloads

## Workforce Capabilities

Our people are our greatest asset. KSC employs over 2,100 civil servants and approximately 11,000 on-or near-site support contractors.

While the skill sets of the workforce are diverse, some of the largest groups include engineers, scientists, and technicians. Using these highly trained personnel, with specialized expertise, KSC remains a leader in launch, launch vehicle processing, and cutting-edge research and development in areas of physics, chemistry, technology, prototype designing, engineering, integration and testing, remediation and ecosystem science, and in-situ resource utilization.

Nearly 62 out of every 1,000 Space Coast residents is an engineer—one of the highest concentrations in the nation.



## Technological Capabilities

KSC is not widely known for early stage technology development, but we have significant experience in developing technologies that can be applied to real life situations.

Examples include:

Novel smart (Self-Healing) coating development with microcapsules that change color to indicate corrosion

Wire fault detection and Self-Repair

Electrodynamic dust shield technology for self-cleaning surfaces

Human robotic systems

Cryogenic orbital testing capabilities such as potential future missions like CRYOTE provide a low-risk environment to demonstrate a broad array of critical cryo-fluid management technologies that can't be tested in Earth's gravity.

This type of experience in technology development and space processing can be used as a resource for both our commercial and government partners.



**PARTNERING CAPABILITIES**

Center Planning and Development Office

- KSC's "front door"
- Master plan infrastructure, land use, and real estate strategies
- Commercial space transportation and services
- Retention of highly skilled aerospace workforce and facility assets

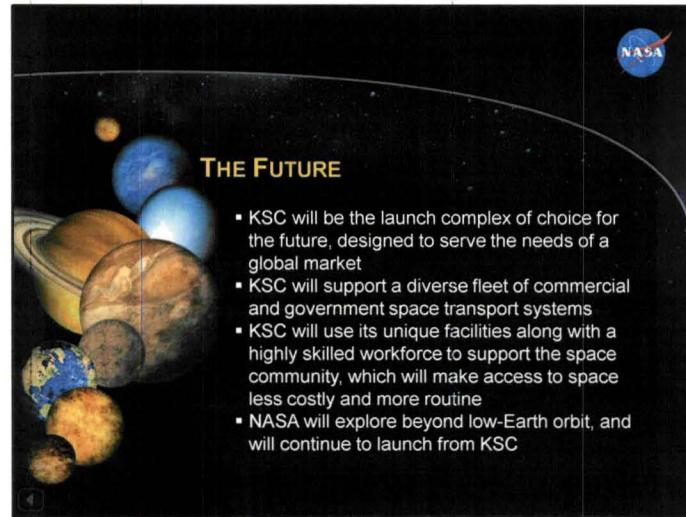
*Actively exploring more than 50 potential partnerships*

## Partnership Opportunities - Center Planning and Development Office (CPDO) Forging Partnerships

To help KSC move forward, the Center Planning and Development Office was formed in October 2008 to act as KSC's "Front Door" for interaction with entities wanting to engage in new business, which has placed an increased focus on enabling commercial space transportation and other services. The mission of CPDO is to facilitate retention of the highly skilled aerospace workforce, as well as KSC's facility assets by attracting new business to establish a presence on or near KSC.

KSC and Space Florida have targeted ten market areas that align with the Center's mission and vision. Space Transportation & Technologies Support Systems - Satellite Systems and Payloads - Ground & Operations Support Systems - Agriculture, Climate & Environmental Monitoring - Civil Protection & Emergency Management - ISS and Human Life Sciences - Communications, Cybersecurity and Robotics - Adventure Tourism - Clean Energy - Advanced Materials & New Products. Throughout all of 2010 and moving forward in 2011, CPDO has engaged in discussions with more than 100 potential industry partners regarding their company-specific needs and requirements that might be met by utilizing the center's unique facilities and capabilities. They provided more than 50 tours to interested parties, and by year-end, Kennedy was engaged in actively exploring more than 50 potential partnerships.

Current partnership opportunities include – Space Act Agreement recently signed with Sierra Nevada, ongoing negotiations with potential partners continue. In August 2010, the Federal Aviation Administration (FAA) established a new university-led Center of Excellence (COE) for Commercial Space Transportation to perform research and development to help build a safe and strong U.S. commercial space industry. KSC also worked with the FAA's Office of Commercial Space Transportation regarding plans to establish an FAA Technical Center at the Center starting in FY2012.



## The Future

In the months ahead, KSC will continue to develop new plans and realign our organizations and processes to support NASA's new direction. While the times may be challenging, they are also exciting. The planning we have done over the past year has made KSC well-equipped to move forward in this new direction.

- Kennedy Space Center will emerge as the launch complex of the future, designed to serve the needs of the worldwide aerospace community.
- As a result of successful planning, we will move KSC to occupy a broader, bolder place within the worldwide space community, supporting a variety of private and public customers.
- The Center has the capabilities, facilities and highly skilled workforce to provide unique and significant skills to the space community. And has the capabilities to make accessing space less costly and more routine.
- NASA will continue to explore beyond low-Earth orbit, and that effort will continue to launch from KSC.

